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**Documentation for the
Machine-Readable Version of the
University of Michigan Catalogue of
Two-Dimensional Spectral Types
for the HD Stars**

Volume 2: Declinations $-53^{\circ}0$ to $-40^{\circ}0$

April 1981

DOCUMENTATION FOR THE MACHINE-READABLE
VERSION OF THE UNIVERSITY OF MICHIGAN CATALOGUE OF
TWO-DIMENSIONAL SPECTRAL TYPES FOR THE HD STARS

VOLUME 2: DECLINATIONS $-53^{\circ}0$ to $-40^{\circ}0$

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April 1981

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TABLE OF CONTENTS

Section 1 - INTRODUCTION	1-1
Section 2 - TAPE CONTENTS	2-1
Section 3 - TAPE CHARACTERISTICS	3-1
Section 4 - REMARKS AND MODIFICATIONS	4-1
Section 5 - SAMPLE LISTING	5-1

LIST OF TABLES

Table

1 Tape Contents	2-1
2 Tape Contents of Remarks File	2-4
3 Tape Characteristics	3-1
4 Plate Codes	4-2
5 Description of Remarks	4-4

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SECTION 1 - INTRODUCTION

This document describes the magnetic tape version of Volume 2 of the University of Michigan systematic reclassification program for the *Henry Draper Catalogue* (HD) stars on the MK system. Volume 2 contains all HD stars in the declination range $-53^{\circ}0' < \delta_{1900} < -40^{\circ}0'$ and also exists in printed form (Houk, N. 1978, Department of Astronomy, University of Michigan). The magnetic tape version of Volume 1 of the catalogue (Houk, N. and Cowley, A. P. 1975, Department of Astronomy, University of Michigan) containing HD stars in the zones $-90^{\circ}0' < \delta_{1900} < -53^{\circ}0'$ is described by Nagy, T. A. 1979, Systems and Applied Sciences Corporation document R-SAW-7/79-30.

The format of Volume 2 differs slightly from that of Volume 1 in the following ways:

1. More accurate equatorial coordinates, as taken from a tape provided by the Centre de Données Stellaires (CDS), Strasbourg, are included.
2. In addition to CPD designations (also provided in Volume 1) CD identifications are given.
3. A new remarks code "D" is provided to indicate stars listed in the CDS tape file as double, but not detected as double during reclassification.

This documentation is intended to fully describe the tape version of the catalogue, to enable users to read and process the data records without problems and guesswork. It should be distributed with any machine-readable version of the catalogue.

SECTION 2 - TAPE CONTENTS

A byte-by-byte description of the contents of the catalogue is given in Table 1. The suggested format is given in the final column.

Table 1. Tape Contents. University of Michigan Catalogue of Spectral Types for the HD Stars, Volume 2.

Byte(s)	Description	Suggested Format
1- 6	HD Number	I6
7	Blank or * (if spectral type contains lower case letters in the printed version of the catalogue)	A1
8	Blank or + (if spectral type not classifiable and taken from the HD Catalogue)	A1
9- 25	Spectral classification	17A1
26	Blank	1X
27	Blank or A (when classification used is an average; quality used is then the highest of the qualities used to form the average: blank when not an averaged type)	A1
28	Quality: 1 = spectrum near optimum exposure and not overlapped with another spectrum 2 = spectrum may be slightly underexposed or overexposed, or there may be slight overlapping of two or more spectra 3 = spectrum quite overlapped by one or more spectra, or noticeably underexposed 4 = badly overlapped spectra or underexposed spectrum, but classification still probably better than HD	I1
29- 33	Remark (see Table 5 for description of remarks)	5A1
34	Blank	1X

Table 1. (continued)

Byte(s)	Description	Suggested Format
35- 40	Magnitude, photographic from the HD Catalogue. If no photographic magnitude is given in the HD, this field contains 99.99. The decimal point is contained in byte 38, but only one significant digit is given (except for 99.99); therefore, if the magnitude is read and printed as F6.2, a zero will appear where a blank should be printed. It is recommended that the magnitude be read and printed in character format unless calculations are to be performed with it.	6A1
41	Blank or V (when the star is a known or suspected variable and is not covered by an individual entry in the remarks file).	A1
42	Blank	1X
43- 52	Right Ascension (1900) 43 - 44 hours 45 blank 46 - 47 minutes 48 blank 49 - 52 seconds	I2 1X I2 1X F4.1
53	Blank	1X
54- 62	Declination (1900) 54 - 56 degrees 57 blank 58 - 59 arcminutes 60 blank 61 - 62 arcseconds	I3 1X I2 1X I2
63	Blank	1X
64- 72	Centennial precession in α 64 - 67 minutes of time 68 blank 69 - 72 seconds of time	I4 1X F4.1
73	Blank	1X
74- 79	Centennial precession in δ 74 - 76 arcminutes 77 blank 78 - 79 arcseconds	I3 1X I2

Table 1. (concluded)

Byte(s)	Description	Suggested Format
80	Blank	1X
81- 85	Galactic longitude (degrees)	F5.1
86	Blank	1X
87- 91	Galactic latitude (degrees)	F5.1
92	Blank	1X
93-101	CPD number (blank if none)	
	93 sign	A1
	94- 95 zone	A2
	96 blank	1X
	97-101 number	A5
102	Blank	1X
103-111	CD number (blank if none)	
	103 sign	A1
	104-105 zone	A2
	106 blank	1X
	107-111 number	A5
112	Blank	1X
113-115	Plate code #1 (each plate has an identification code; Table 4 gives plate numbers and exposure dates for the listed codes, while a digit in byte 113 indicates the number of plates used to determine the average spectral type given)	A3
116	Comma (,)	A1 or 1X
117-119	plate code #2	A3
120	Comma (,)	A1 or 1X
121-123	Plate code #3	A3
124	Comma (,)	A1 or 1X
125-127	Plate code #4	A3

Table 2. Tape Contents of Remarks File. University of Michigan Catalogue of Spectral Types for the HD Stars. Volume 2

Byte(s)	Description	Suggested Format
1- 6	HD number	I6
7-400	Remarks--free form	98A4,A2

SECTION 3 - TAPE CHARACTERISTICS

The information contained in Table 3 is sufficient to enable a user to read the machine version of the catalogue. Information for the entire catalogue (both files) is given in the table, but parameters which are easily varied from installation to installation, such as blocksize (physical record length), blocking factor (number of logical records per physical record), total number of blocks, tape density, and coding (EBCDIC, ASCII) are not included: this information should always be supplied if copies of the catalogue are transmitted to other users or installations.

Table 3. Tape Characteristics. University of Michigan Catalogue of Spectral Types for the HD Stars. Volume 2

NUMBER OF TRACKS	9
NUMBER OF FILES	2
LOGICAL RECORD LENGTH	127,400
RECORD FORMAT	FR
NUMBER OF LOGICAL RECORDS30400,4950

The numbers separated by commas refer to the first and second files of the catalogue, respectively. Logical record lengths are given in bytes (characters).

SECTION 4 - REMARKS AND MODIFICATIONS

A magnetic tape containing the catalogue was received from the University of Michigan in September 1978, along with a letter defining the format and detailing differences from that of Volume 1 of the catalogue, and some sample copies of the preface to the printed version. Tables 4 and 5 of this document, describing the plate codes and remarks, have been reproduced from the preface for the convenience of users not having access to the printed version; however, for catalogue statistics, discussion of classification procedures, qualities and averaging, and a list of the primary standards, the printed version (Houk, N. 1978, Department of Astronomy, University of Michigan, Ann Arbor, Michigan 48104) should be consulted.

The following modifications have been made to the original tape records to facilitate computer searching of the catalogue for spectral temperature classes: (a) The * indicating lower case letters in spectral type (cf. byte 7, Table 1) was originally in byte 8. It was moved to byte 7 (replacing a blank) so that the + sign (cf. byte 8, Table 1), which was originally contained in the first byte of the spectral type field (byte 9) could be moved to byte 8. This places the temperature class and subclass always in bytes 9-10 for easier searching. (b) To simplify processing of the remarks file, originally supplied with undefined record lengths, the file has been converted by Dr. Theresa A. Nagy of the Astronomical Data Center to a fixed logical record length of 400 bytes.

TABLE 4

Plate Code	Plate No.	Date Plate Taken	Plate Code	Plate No.	Date Plate Taken	Plate Code	Plate No.	Date Plate Taken	Plate Code	Plate No.	Date Plate Taken
HW	8030	Feb. 21/22, 71	JO	5920	Feb. 9/10, 70	LG	16624	Aug. 13/14, 74	MY	17153	Dec. 4/5, 74
HX	8029	Feb. 21/22, 71	JP	2332	May 29/30, 68	LH	3231	Dec. 9/10, 68	NZ	17155	Dec. 4/5, 74
HY	8031	Feb. 21/22, 71	JQ	2420	June 4/5, 68	LI	16625	Aug. 13/14, 74	NA	3287	Dec. 14/15, 68
HZ	8102	Feb. 25/26, 71	JR	16511	Aug. 9/10, 74	LJ	7261	Aug. 28/29, 70	NB	3310	Dec. 16/17, 68
IA	8129	Feb. 25/26, 71	JS	2335	May 29/30, 68	LR	3230	Dec. 9/10, 68	NC	3289	Dec. 14/15, 68
IB	8103	Feb. 25/26, 71	JT	2331	May 29/30, 68	LL	3232	Dec. 9/10, 68	ND	3290	Dec. 14/15, 68
IC	8100	Feb. 25/26, 71	JU	992	Oct. 23/24, 67	LM	3233	Dec. 9/10, 68	NE	12209	Dec. 30/31, 72
ID	2161	May 19/20, 68	JV	993	Oct. 23/24, 67	LN	3234	Dec. 9/10, 68	NF	12210	Dec. 30/31, 72
IE	2162	May 19/20, 68	JW	995	Oct. 23/24, 67	LO	3235	Dec. 9/10, 68	NG	7296	Aug. 31/Sept 1, 70
IF	2163	May 19/20, 68	JX	996	Oct. 23/24, 67	LP	3308	Dec. 16/17, 68	NH	15526	Jan. 22/23, 71
IG	8202	Mar. 3/4, 71	JY	997	Oct. 23/24, 67	LQ	3309	Dec. 16/17, 68	NI	2185	May 20/21, 68
IH	8442	Mar. 27/28, 71	JZ	998	Oct. 23/24, 67	LR	1159	Nov. 7/8, 67	NJ	3329	Dec. 17/18, 68
II	8443	Mar. 27/28, 71	KA	5694	Oct. 13/14, 71	LS	1160	Nov. 7/8, 67	NK	12153	Dec. 27/28, 72
IJ	8444	Mar. 27/28, 71	KB	999	Oct. 23/24, 67	LT	1161	Nov. 7/8, 67	NL	3328	Dec. 17/18, 68
IK	2330	May 29/30, 68	KC	7297	Aug. 31/Sept 1, 70	LU	1162	Nov. 7/8, 67	NM	3012	Feb. 20/21, 71
IL	10737	Mar. 20/21, 72	KD	2205	May 21/22, 68	LV	3331	Dec. 17/18, 68	NN	2402	June 3/4, 68
IM	1173	Nov. 11/12, 67	KE	2206	May 21/22, 68	LW	7886	Jan. 28/29, 71	NO	16508	Aug. 9/10, 74
IN	10739	Mar. 20/21, 72	KF	13544	June 1/2, 73	LX	2378	June 1/2, 68	NP	16509	Aug. 9/10, 74
IO	12208	Dec. 30/31, 72	KG	10707	Mar. 19/20, 72	LY	2379	June 1/2, 68	NQ	5921	Feb. 9/10, 70
IP	7890	Jan. 28/29, 71	KH	10709	Mar. 19/20, 72	LZ	2380	June 1/2, 68	NR	3411	Dec. 27/28, 68
IQ	7891	Jan. 28/29, 71	KI	70	May 12/13, 67	MA	2381	June 1/2, 68	NS	8452	Mar. 29/30, 71
IR	2164	May 19/20, 68	KJ	16475	Aug. 7/8, 74	MB	13532	May 31/June 1, 73	NT	3606	Jan. 21/22, 69
IS	2165	May 19/20, 68	KK	2376	June 1/2, 68	MC	978	Oct. 20/21, 67	NU	2253	May 25/26, 68
IT	16504	Aug. 9/10, 74	KL	2377	June 1/2, 68	MD	979	Oct. 20/21, 67	NV	2254	May 25/26, 68
IU	8201	May 3/4, 71	KM	2399	June 3/4, 68	ME	980	Oct. 20/21, 67	NW	2255	May 25/26, 68
IV	15524	Jan. 22/23, 74	KN	2400	June 3/4, 68	MF	4823	July 15/16, 69	NX	2256	May 25/26, 68
IW	7892	Jan. 28/29, 71	KO	2401	June 3/4, 68	MG	4824	July 15/16, 69	NY	2219	May 22/23, 68
IX	7875	Jan. 27/28, 71	KP	11720	Oct. 10/11, 72	MH	7295	Aug. 31/Sept 1, 70	NZ	2184	May 20/21, 68
IY	7889	Jan. 28/29, 71	KQ	3236	Dec. 10/11, 68	MI	7888	Jan. 28/29, 71	OA	2220	May 22/23, 68
IZ	7876	Jan. 27/28, 71	KR	3237	Dec. 10/11, 68	MJ	2182	May 20/21, 68	OB	2201	May 21/22, 68
JA	7877	Jan. 27/28, 71	KS	3238	Dec. 10/11, 68	MK	2183	May 20/21, 68	OC	2202	May 21/22, 68
JB	8453	Mar. 29/30, 71	KT	1146	Nov. 6/7, 67	ML	2166	May 19/20, 68	OD	2291	May 28/29, 68
JC	2152	May 18/19, 68	KU	1156	Nov. 7/8, 67	MM	2168	May 19/20, 68	OE	2204	May 21/22, 68
JD	10672	Mar. 18/19, 72	KV	1157	Nov. 7/8, 67	MN	2169	May 19/20, 68	OF	16510	Aug. 9/10, 74
JE	2149	May 18/19, 68	KW	1158	Nov. 7/8, 67	MO	2151	May 18/19, 68	OG	2382	June 1/2, 68
JF	11055	Apr. 23/24, 72	KX	1148	Nov. 6/7, 67	MP	994	Oct. 23/24, 67	OH	2383	June 1/2, 68
JG	11041	Apr. 22/23, 72	KY	1151	Nov. 6/7, 67	MQ	11641	Oct. 3/4, 72	OI	2384	June 1/2, 68
JH	10674	Mar. 18/19, 72	KZ	1152	Nov. 6/7, 67	MR	11626	Aug. 13/14, 74	OJ	4613	June 16/17, 69
JI	2150	May 18/19, 68	LA	1153	Nov. 6/7, 67	MS	9562	Sept. 23/24, 71	OK	4614	June 16/17, 69
JJ	2327	May 29/30, 68	LB	1154	Nov. 6/7, 67	MT	11627	Aug. 13/14, 74	OL	4615	June 16/17, 69
JK	11039	Apr. 22/23, 72	LC	1172	Nov. 11/12, 67	MU	3293	Dec. 15/16, 68	OM	4616	June 16/17, 69
JL	2328	May 29/30, 68	LD	2284	May 28/29, 68	MV	3283	Dec. 14/15, 68			
JM	2417	June 4/5, 68	LE	2237	May 24/25, 68	MW	3284	Dec. 14/15, 68			
JN	11043	Apr. 22/23, 72	LF	2238	May 24/25, 68	MX	3322	Dec. 17/18, 68			

TABLE 4 Con. luded

Plate Code	Plate No.	Date Taken	Plate Code	Plate No.	Date Taken	Plate Code	Plate No.	Date Taken	Plate Code	Plate No.	Date Taken
SMN	10596	Mar. 17/18, 72	SKL	11048	Apr. 22/23, 72	4JV	11710	Oct. 10/11, 72	4MC	13533	May 31/June 1, 73
SMX	10595	Mar. 17/18, 72	SLB	10589	Mar. 17/18, 72	4JW	11712	Oct. 10/11, 72	4MD	13534	May 31/June 1, 73
SMY	10597	Mar. 17/18, 72	SLD	10605	Mar. 17/18, 72	4JX	11713	Oct. 10/11, 72	4ME	13535	May 31/June 1, 73
SMZ	10600	Mar. 17/18, 72	SLF	10606	Mar. 17/18, 72	4JY	11714	Oct. 10/11, 72	4MF	13536	May 31/June 1, 73
SIA	10599	Mar. 17/18, 72	SLF	10607	Mar. 17/18, 72	4JZ	11715	Oct. 10/11, 72	4MG	13891	Sept 29/30, 73
SIB	10618	Mar. 17/18, 72	SLV	10770	Apr. 4/5, 72	4KA	11718	Oct. 10/11, 72	4MH	13892	Sept 29/30, 73
SIC	10626	Mar. 17/18, 72	SLW	10771	Apr. 4/5, 72	4KB	11716	Oct. 10/11, 72	4MP	16512	Aug. 9/10, 74
SID	10619	Mar. 17/18, 72	SMI	10772	Apr. 4/5, 72	4KE	11717	Oct. 10/11, 72	4MQ	11640	Oct. 3/4, 72
SIE	10620	Mar. 17/18, 72	SMJ	10608	Mar. 17/18, 72	4KF	13189	Apr. 27/28, 72	4MR	20030	Oct. 21/22, 76
SIF	10621	Mar. 17/18, 72	SMK	10609	Mar. 17/18, 72	4KI	13190	Apr. 27/28, 72	4MS	16545	Aug. 10/11, 74
SIG	10627	Mar. 17/18, 72	SML	10662	Mar. 17/18, 72	4JM	13598	June 3/4, 73	4MT	16546	Aug. 10/11, 74
SIM	10628	Mar. 17/18, 72	SMN	10664	Mar. 17/18, 72	4KN	13599	June 3/4, 73	4MU	12227	Jan. 1/2, 73
SII	10629	Mar. 17/18, 72	SMO	10665	Mar. 18/19, 72	4KO	13498	May 30/31, 73	4MV	12228	Jan. 1/2, 73
SIJ	10736	Mar. 20/21, 72	SMO	10666	Mar. 18/19, 72	4KP	11719	Oct. 10/11, 72	4MW	12229	Jan. 1/2, 73
SIK	10738	Mar. 20/21, 72	SMC	10776	Apr. 4/5, 72	4KQ	11721	Oct. 10/11, 72	4MX	12226	Jan. 1/2, 73
SIM	10591	Mar. 17/18, 72	SMO	10777	Apr. 4/5, 72	4KR	11722	Oct. 10/11, 72	4MY	17154	Dec. 4/5, 74
SIN	10740	Mar. 20/21, 72	SMF	10778	Apr. 4/5, 72	4KS	11615	Oct. 2/3, 72	4MZ	12180	Dec. 29/30, 72
SIO	10592	Mar. 17/18, 72	SMF	10779	Apr. 4/5, 72	4KT	11616	Oct. 2/3, 72	4NA	12149	Dec. 27/28, 72
SIP	10593	Mar. 17/18, 72	SMH	10783	Apr. 4/5, 72	4KU	11617	Oct. 2/3, 72	4NB	12150	Dec. 27/28, 72
SIQ	10594	Mar. 17/18, 72	SMI	10663	Mar. 17/18, 72	4KV	11618	Oct. 2/3, 72	4NG	13893	Sept 29/30, 73
SIR	10622	Mar. 17/18, 72	SMH	10780	Apr. 4/5, 72	4KW	11619	Oct. 2/3, 72	4NJ	12152	Dec. 27/28, 72
SIS	10623	Mar. 17/18, 72	SMQ	10782	Apr. 4/5, 72	4KX	12144	Dec. 27/28, 72	4NK	12154	Dec. 27/28, 72
SIU	10626	Mar. 17/18, 72	SMR	10784	Apr. 4/5, 72	4KY	12145	Dec. 27/28, 72	4NL	12151	Dec. 27/28, 72
SIV	10774	Apr. 4/5, 72	SMO	10651	Mar. 18/19, 72	4KZ	12146	Dec. 27/28, 72	4NN	13499	May 30/31, 73
SIW	10775	Apr. 4/5, 72	SMT	10652	Mar. 18/19, 72	4LA	12147	Dec. 27/28, 72	4NO	13500	May 30/31, 73
SIX	10601	Mar. 17/18, 72	SMU	10653	Mar. 18/19, 72	4LC	12148	Dec. 27/28, 72	4NP	13501	May 30/31, 73
SIY	10773	Apr. 4/5, 72	SMV	10654	Mar. 18/19, 72	4LG	11642	Oct. 3/4, 72	4OF	13502	May 30/31, 72
SIZ	10602	Mar. 17/18, 72	SMW	10655	Mar. 18/19, 72	4LH	11646	Oct. 3/4, 72	4OG	13503	May 30/31, 72
SJA	10603	Mar. 17/18, 72	SMX	10656	Mar. 18/19, 72	4LI	11643	Oct. 3/4, 72	4OH	16535	Aug. 10/11, 74
SJC	10667	Mar. 18/19, 72	SMY	10657	Mar. 18/19, 72	4LJ	11644	Oct. 3/4, 72	4OI	16536	Aug. 10/11, 74
SJD	10673	Mar. 18/19, 72	SOA	10658	Mar. 18/19, 72	4LK	11645	Oct. 3/4, 72	4OJ	16537	Aug. 10/11, 74
SJE	10624	Mar. 17/18, 72	SOB	10659	Mar. 18/19, 72	4LL	11647	Oct. 3/4, 72	4OK	11637	Oct. 3/4, 72
SJF	11056	Apr. 23/24, 72	SOC	10660	Mar. 18/19, 72	4LM	12156	Dec. 28/29, 72	4OL	11638	Oct. 3/4, 72
SJG	11042	Apr. 22/23, 72	SOD	10668	Mar. 18/19, 72	4LN	12157	Dec. 28/29, 72	4OM	11659	Oct. 3/4, 72
SJH	10675	Mar. 18/19, 72	SOE	10669	Mar. 18/19, 72	4LO	12158	Dec. 28/29, 72	4NI	5919	Feb. 9/10, 70
SJI	10625	Mar. 17/18, 72	4IK	13600	June 3/4, 73	4LP	12159	Dec. 28/29, 72	4NN	5415	Dec. 28/29, 68
SJK	11040	Apr. 22/23, 72	4IT	13437	May 26/27, 73	4LQ	12160	Dec. 28/29, 72	4NH	95	May 16/17, 67
SJM	11045	Apr. 22/23, 72	4JB	12281	Jan. 2/3, 73	4LR	12161	Dec. 28/29, 72	4NI	13473	May 27/28, 73
SJN	11044	Apr. 22/23, 72	4JJ	13435	May 26/27, 73	4LS	15574	Jan. 28/29, 74	4NS	7317	Sept. 6, 70
SJO	10787	Apr. 4/5, 72	4JL	13436	May 26/27, 73	4LT	12163	Dec. 28/29, 72	4NT	5021	Aug. 12/13, 69
SJP	10670	Mar. 18/19, 72	4JP	13603	June 3/4, 73	4LU	12164	Dec. 28/29, 72	4NE	5413	Dec. 28/29, 68
SJE	10671	Mar. 18/19, 72	4JQ	13604	June 3/4, 73	4LX	13602	June 3/4, 73	4NF	6074	Mar. 6/7, 70
SKG	10708	Mar. 18/19, 72	4JR	13605	June 3/4, 73	4LY	13345	May 12/13, 73	4NM	6075	Mar. 6/7, 70
SKH	10710	Mar. 18/19, 72	4JS	13606	June 3/4, 73	4LZ	13343	May 12/13, 73			
SKJ	11046	Apr. 22/23, 72	4JT	13601	June 3/4, 73	4MA	13344	May 12/13, 73			
SKA	11047	Apr. 22/23, 72	4JU	11709	Oct. 10/11, 72	4MB	13346	May 12/13, 73			

V. Description of Remarks

Further information about 4950 stars is given in the back of the catalogue. To aid the user in deciding whether to consult the remarks for a particular star, the following notation is used in Column 3 of the catalogue:

B indicates that the remark contains the HR (Bright Star Catalogue) number and the Bayer or Flamsteed designations where applicable.

L indicates that information from the astronomical literature is given. In most cases individual literature references are not given; references systematically searched by A. P. Cowley are listed at the end of this section. Remarks were generally restricted to those relevant to the spectral appearance, such as rotation, variability, and duplicity, and generally have included only information about the star which might affect the spectral classification.

O includes remarks that do not fit into any other category. Almost all of these are NGC or IC designations for nebulae.

R Nearly half of the stars in the remarks section have remarks of this type. All 'R' remarks were written by NH in the course of the spectral classification and all are related in some way to the spectrum. Most of the symbols and notation are self-explanatory, but note that "yld." was used for yields and yield (followed by a temperature or luminosity type) since an arrow \rightarrow or an implies sign was not available. Note also that in quotations the close quote sign is the same as the open quote sign and hence faces the wrong direction. We discuss some of the more frequent types of 'R' remarks, in order of frequency of occurrence.

464 stars in the catalogue have composite spectra or possibly composite spectra and each of these has a remark so that it can be easily differentiated from known double stars which also sometimes have two types listed in the catalogue.

In 318 cases the fact that the star was visually double was deduced from the appearance of the spectrum (fuzzy, double-lined, or closely overlapped) and the following data were listed (taken from Lick Publ. 21, 1963, unless otherwise noted): position angle p , angular distance d , and magnitudes of components. Sometimes a rough spectral type for the secondary component is also listed in the remarks, but often only a single type is listed in the catalogue, and it may actually be an average of the two components in some cases.

Remarks are made for all stars (≈ 150) showing emission or filled-in lines, and the lines in emission are identified in the remark. For nebulae the lines in emission are often not listed.

The great majority of Am stars do not have remarks, but ≈ 100 do. Similarly some 125 of the Ap stars have 'R' remarks. For both Am and Ap stars these are mainly weak or questionable cases, and the spectral type listed in the catalogue may not indicate the possible metallic-line

or peculiar nature of the star. Unusual and extremely strong cases are also included among the remarks.

About 100 of the 'R' remarks pertain to fuzzy or closely overlapped spectra some of which are probably new visual or spectroscopic doubles.

Almost all of the ≈ 55 weak-metal stars have 'R' remarks. In many cases the spectral type indicated by the G band is given to supplement the H-line and metallic-line types given in the catalogue. Slight or questionable and extreme cases are also noted.

About 35 stars of widely different spectral types have 'R' remarks because the various spectral line ratios indicate discrepant temperature or luminosity types and it was not possible to arrive at a consistent type. Some of these are certainly due to the composite or closely double nature of the stars, while others reflect abundance anomalies. Still others may be caused by overlapping spectra or emulsion defects.

Other smaller categories of 'R' remarks include:

≈ 15 substantial disagreements with the HD catalogue, mainly with respect to spectral types; ≈ 30 possible Fm δ Del types; ≈ 45 stars with strong CH—these are not indicated in the catalogue spectral types.

D The Stellar Data Center at Strasbourg provided a listing of visual double stars. Remarks beginning "undetected visual double" were included for doubles not discovered in the course of the spectral classification, the others having 'R' remarks. 'D' remarks were included for the 1874 doubles having a separation $\leq 30''$ and a Δ mag < 4.0 mag, since for these the spectral appearance and hence the assigned spectral type might be affected. No 'R' remarks were changed, so note that some spurious "Am" and "weak-lined" remarks remain.

V All variables and suspected variables are indicated by a 'V' after the magnitude. Each has a remark in the back of the catalogue giving variable star designation, type of variability, magnitude range, and period, where these are known.

† All spectral types in the catalogue taken from other sources are preceded by a dagger. Each such star has a remark giving the reason the star could not be classified on Michigan plates and the source of the classification. All but 120 were taken from the HD catalogue. In the case of types taken from the catalogues by Jaschek *et al.* (1964) and by Kennedy and Buscombe (1974) the above are quoted rather than the original reference in these catalogues. MK types for stars brighter than $4^m.75$ not included in the paper by Hiltner, Garrison, and Schildt referenced below have been kindly provided by R. F. Garrison prior to publication. Although the types are preliminary, they are on a more homogeneous system than any others available. References marked with a dagger below were used as sources for spectral types. Stars which were too faint to classify on Michigan plates were not searched for in the dagger references since chances of them being found were small. Instead the HD type was given.

References

L = reference for L remarks
V = reference for V remarks
† = reference for † remarks

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SECTION 5 - SAMPLE LISTING

The sample listing given on the following pages contains logical data records exactly as they are recorded on the tape. The beginning of each record and bytes within the record are indicated by the column heading index across the top of the page (digits read vertically). Since logical records in both files are longer than 115 bytes, remainders of the records (bytes 116-127 for file 1; bytes 116-230 for file 2) are printed in succeeding rows. (For the remarks file, the third row of each record contains bytes 231-345 and the fourth row bytes 346-400.)

LISTING OF RECORDS FROM TAPE PILE

TAPPE FILE NAME: MICHIGAN NC, V. 2 NOTES

RECORDS 1 TO 7

TAFE FILE **4**

SALES COM WISNET RECORD

INPUT VOLSPR WHW12

1500
1500
1500
1500
1500

[illegible][illegible]

9 BR 741 1 380214

010319 2 304 CC420517P

RECORD J J8J UNDETECTED VISUAL DOUBLE IP=285 *DG ID=1.1 *APCSC MAGS 10.J, 11.3

429 UNDETECTED VISUAL DOUBLE IP-126 *DC ID-8.2 *ARCSC MAGS 8.5, 11.2

ICED 5 470 UNCECEPCSD; VRY POSSIBLY COMPOSITE

RECORD 6 479 UNDETECTED VISUAL DOUBLE IP=316 *DG ID=0.6 *ARCSC MAGS 8.6, 11.6

010317 1 496 HH 25: 02PSILON PH2

